CLAIMS

I/We claim:

1. A method of liquefying a gas, comprising:

pressurizing a liquid;

mixing a reactant composition with the pressurized liquid to generate a high pressure gas;

supplying the high pressure gas to an expansion engine which produces a gas having a reduced pressure and temperature, and which further generates a power and/or work output;

coupling the expansion engine in fluid flowing relation relative to a refrigeration assembly, and wherein the gas having the reduced temperature is provided to the refrigeration assembly; and

energizing the refrigeration assembly, at least in part, by supplying the power and/or work output generated by the expansion engine to the refrigeration assembly, the refrigeration assembly further reducing the temperature of the gas to liquefy the gas.

2. A method as claimed in claim 1, and wherein the step of pressurizing a liquid further comprises:

providing a container which is coupled in fluid flowing relation relative to the expansion engine and which encloses the liquid;

providing a charging pump which is coupled in fluid flowing relation relative to the container and which pressurizes the liquid enclosed by the container.

3. A method as claimed in claim 1, and wherein the step of mixing a reactant composition with the pressurized liquid further comprises:

enclosing the reactant composition in a plurality of individual frangible containers; and

supplying and then fracturing the individual frangible containers which are provided to the pressurized liquid to expose the reactant composition to the liquid.

4. A method as claimed in claim 1, and wherein the step of mixing a reactant composition with the pressurized liquid further comprises:

mixing the reactant composition with an inert fluid carrier; and

mixing the reactant composition and inert fluid carrier with the pressurized liquid.

5. A method as claimed in claim 1, and wherein the step of pressurizing a liquid further comprises:

providing a source water, and wherein the step of supplying a reactant compound further comprises providing a source of chemical hydride which chemically reacts with the water to generate hydrogen gas.

6. A method as claimed in claim 1, and wherein the step of pressurizing the liquid further comprises pressurizing the liquid to at least about 150 pounds per square inch.

7. A method as claimed in claim 1, and wherein the step of pressurizing the liquid further comprises pressurizing the liquid to a pressure which causes the resulting high pressure gas to have a pressure of at least about 150 pounds per square inch.

8. A method as claimed in claim 7, and wherein the step of supplying the high pressure gas to the expansion engine further comprises producing a gas having a reduced temperature of less that about 50 degrees C, and a pressure greater than about 1 ATM or ambient.

9. A method as claimed in claim 1, and wherein the step of supplying the high pressure gas to the expansion engine further comprises providing a turbo-expander which is coupled in fluid receiving relation relative to the high pressure gas, and wherein the turbo-expander generates a power and/or work output which provides a preponderance of the power need by the refrigeration assembly to liquefy the gas.

10. A method as claimed in claim 1, and wherein after the step of energizing the refrigeration assembly, the method further comprises:

delivering the liquefied gas to a container, and wherein the liquefied gas is utilized as fuel.

11. A method of liquefying a gas, comprising;

providing a container;

supplying a liquid to the container;

coupling a charging pump in fluid flowing relation relative to the container to increase the pressure of the liquid within the container;

providing a reactant compound and supplying the reactant compound to the liquid which is under pressure in the container, and wherein the reactant compound chemically reacts with the liquid to generate a high pressure gas;

providing an expansion engine and coupling the expansion engine in fluid receiving relation relative to the container to receive the high pressure gas, and wherein the expansion engine, upon receiving the high pressure gas, provides a resulting power and/or work output, and further provides a gas having a reduced temperature and pressure;

providing a refrigeration assembly, and coupling the expansion engine in fluid flowing relation relative to the refrigeration assembly, and wherein the gas having the reduced temperature and pressure is supplied to the refrigeration assembly; and

supplying the power and/or work output generated by the expansion engine to energize and/or actuate the refrigeration assembly, and wherein the refrigeration assembly, when energized, liquefies the gas having the reduced temperature and pressure and which is delivered from the expansion engine.

12. A method as claimed in claim 11, and wherein the step of supplying liquid to the container further comprises:

supplying a source of water which chemically reacts with the reactant compound to produce the high pressure gas.

13. A method as claimed in claim 11, and wherein the step of providing a reactant compound and supplying the reactant compound to the liquid further comprises:

providing an assembly for selectively metering the reactant compound to the container.

14. A method as claimed in claim 11, and wherein the step of providing the reactant compound further comprises providing a supply of a chemical hydride which chemically reacts with the liquid under pressure to produce a high pressure hydrogen gas.

15. A method as claimed in claim 14, and wherein the step of providing a supply of the chemical hydride further comprises:

enclosing the chemical hydride in a plurality frangible enclosures;

metering the respective frangible enclosures to the container; and

fracturing the respective enclosures so as to expose the chemical hydride to the liquid in the container.

16. A method as claimed in claim 11, and wherein the step of providing the reactant compound further comprises providing a supply of chemical hydride which chemically reacts with the liquid, under pressure, to produce hydrogen gas having a pressure of at least about 150 pounds per square inch and a temperature of less than about 50 degrees C.

17. A method as claimed in claim 16, and wherein the step of providing the expansion engine and coupling the expansion engine in fluid receiving relation relative to the container further comprises reducing the temperature of the gas to at least about -200 degrees F, and reducing the pressure of the gas to less than about 150 pounds per square inch.

18. A method as claimed in claim 11, and wherein the power and/or work output of the expansion engine supplies a preponderance of the power to energize and/or actuate the refrigeration assembly.

19. A method of liquefying a gas, comprising:

providing a container having a volume;

providing a source of water;

providing a charging pump coupled in fluid flowing relation relative to the source of water and with container, the charging pump supplying the source of water to the container and filling the volume thereof to a pressure of greater than about 150 pounds per square inch;

providing a source of a chemical hydride;

metering the source of the chemical hydride to the container, and wherein the source of chemical hydride chemically reacts with the water under pressure to produce a high pressure hydrogen gas which is enclosed within the container;

providing an expansion engine and supplying the high pressure hydrogen gas enclosed within the container to the expansion engine, and wherein the expansion engine

is operable to generate a power and/or work output while simultaneously reducing the pressure and the temperature of the hydrogen gas supplied by the container;

providing a refrigeration assembly and supplying the hydrogen gas having a reduced temperature and pressure to the refrigeration assembly;

supplying the power and/or work output generated by the expansion engine to the refrigeration assembly to energize and/or actuate the refrigeration assembly, and wherein the refrigeration assembly, when energized, reduces the temperature of the hydrogen gas so that it passes from a gaseous phase to a liquid phase; and

supplying the liquid hydrogen to a container for storage.

20. A method as claimed in claim 19, and wherein the step of metering the source of chemical hydride further comprises producing a hydrogen gas having a pressure of at least about 150 pounds per square inch, and a temperature of less than about 50 degrees C.

21. A method as claimed in claim 19, and wherein the step of metering the source of chemical hydride further comprises:

enclosing the source of chemical hydride in a plurality of frangible enclosures; and

fracturing the respective enclosures so as to expose the chemical hydride to the water enclosed within the container.